

NAG Toolbox for MATLAB

a02aa

1 Purpose

a02aa evaluates the square root of the complex number $x = (x_r, x_i)$.

2 Syntax

```
[yr, yi] = a02aa(xr, xi)
```

3 Description

The method of evaluating $y = \sqrt{x}$ depends on the value of x_r .

For $x_r \geq 0$,

$$y_r = \sqrt{\frac{x_r + \sqrt{x_r^2 + x_i^2}}{2}}, \quad y_i = \frac{x_i}{2y_r}.$$

For $x_r < 0$,

$$y_i = \text{sign}(x_i) \times \sqrt{\frac{|x_r| + \sqrt{x_r^2 + x_i^2}}{2}}, \quad y_r = \frac{x_i}{2y_i}.$$

Overflow is avoided when squaring x_i and x_r by calling a02ab to evaluate $\sqrt{x_r^2 + x_i^2}$.

4 References

Wilkinson J H and Reinsch C 1971 *Handbook for Automatic Computation II, Linear Algebra* Springer-Verlag

5 Parameters

5.1 Compulsory Input Parameters

- 1: **xr** – double scalar
- 2: **xi** – double scalar

x_r and x_i , the real and imaginary parts of x , respectively.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

- 1: **yr** – double scalar
- 2: **yi** – double scalar

y_r and y_i , the real and imaginary parts of y , respectively.

6 Error Indicators and Warnings

None.

7 Accuracy

The result should be correct to *machine precision*.

8 Further Comments

The time taken by a02aa is negligible.

9 Example

```
xr = -1.7;  
xi = 2.6;  
[yr, yi] = a02aa(xr, xi)
```

```
yr =  
    0.8386  
yi =  
    1.5502
```